ISSUES CONCERNING THE USE OF TWO-WAY, INTERACTIVE TELEVISION TO DELIVER FIRE-RELATED DEGREE PROGRAMS

EXECUTIVE PLANNING

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ABSTRACT

The importance of fire-related degrees in the professional development of fire service personnel has increased dramatically in recent years. Many career fire departments not only require the attainment of such degrees for eligibility for promotion, they now give preference to degree holders when hiring entry-level personnel. The problem was that individuals already employed by Wisconsin career fire departments, as well as persons seeking career fire department employment, could not readily access fire-related degree programs if they lived in certain areas of the state. If they were unable to commute or relocate to the areas of the state which had degree programs, many simply had no recourse but to forego the pursuit of a degree.

The purpose of this research project was to identify the availability and evaluate the potential of interactive television (ITV) as a viable delivery system for fire-related degree program instruction. The project utilized an action research procedure. Research questions to be answered were:

1. Why do fire fighters and/or aspiring fire fighters residing in certain areas of the state of Wisconsin not have convenient access to fire-related degree programs?
2. Is the utilization of an ITV system a potential alternative to traditional classroom delivery of fire-related education?
3. What kinds of ITV systems currently exist in the state of Wisconsin?

4. What experience does the educational delivery system have with two-way ITV as a teaching medium?
5. Does two-way ITV technology provide the feature desired of a viable alternative delivery system, namely class interaction similar to that experienced in conventional classroom settings?
6. What special provisions must be made in order to implement a successful ITV system?

The procedures required a review of available literature on the subject and interviews with administrators, educators, and students associated with ITV delivery programs and/or systems regarding their opinions, observations, experiences, and recommendations. The findings indicated why fire-related degree programs are not available in every area of the state of Wisconsin, and also the potential for expanding access to such programs through the use of ITV technology. Interviews revealed the level of experience the educational delivery system had with ITV use, the provisions that it had to make in order to implement ITV instruction, and the end result of the ITV classes it had conducted.

This report documents national experience with ITV instruction in a variety of educational disciplines, and also the efforts thus far of the educational delivery system in adapting fire instruction for ITV application.

This report recommends not only continuation of the fire instruction ITV adaptation efforts, but expansion of fire-related degree program offerings via ITV technology throughout the entire state of Wisconsin.

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INTRODUCTION

Career fire departments in the state of Wisconsin have placed steadily increasing importance on their employees' attainment of fire-related associate or bachelor's degrees. Most Wisconsin career fire departments have for many years tied the attainment of such degrees to eligibility for promotion, and many are now giving initial hiring preference to degree holders. This situation has resulted in increased interest statewide in such degree programs.

The problem was that fire fighters and/or aspiring fire fighters residing in certain areas of the state who wished to pursue degrees in fire-related disciplines did not have convenient access to programs. This inaccessibility resulted in the need for these individuals to relocate to areas of the state which had educational institutions with such programs. For many, this need to relocate was a severe hardship. Establishing degree programs in educational institutions in their areas of residence was usually not a viable alternative due to either the high start-up cost of such programs or low student enrollment projections during the program investigation stage.

The purpose of this research project was to identify the availability and evaluate the potential of ITV as a viable education delivery system for fire-related degree program courses.

An action research procedure was used to solve the problem. This researcher reviewed topical literature obtained from the National Emergency Training Center (NETC) Learning Resource Center (LRC). Literature from the Wisconsin Educational Communications Board and from educational institutions of the Wisconsin Technical College and University of Wisconsin systems were also reviewed. Administrators, educators, and students associated with ITV

delivery programs and/or systems were interviewed regarding their opinions, observations, experiences, and recommendations.

The following research questions were answered using the action research procedure:

1. Why do fire fighters and/or aspiring fire fighters residing in certain areas of the state of Wisconsin not have convenient access to fire-related degree programs?
2. Is the utilization of an ITV system a potential alternative to traditional classroom delivery of fire-related education?
3. What kinds of ITV systems currently exist in the state of Wisconsin?
4. What experience does the educational delivery system have with two-way ITV as a teaching medium?
5. Does two-way ITV technology provide the feature desired of a viable alternative delivery system, namely class interaction similar to that experienced in conventional classroom settings?
6. What special provisions must be made in order to implement a successful ITV system?

BACKGROUND AND SIGNIFICANCE

The Wisconsin fire service is comprised of approximately 870 fire departments, with 810 of these organizations consisting entirely of volunteer members. The remaining 60 departments consist of either all career members, or a combination of career and paid-on-call members.

Training and education have been a major part of the activities of Wisconsin fire departments for many years. In the early 1970s such training and education became available from the Wisconsin Board of Vocational, Technical, and Adult Education (WBVTAE), which in 1994 became the Wisconsin Technical College System (WTCS) Board. The WTCS consists of

16 technical college districts, with a total of 47 campuses statewide. It is the primary delivery system for fire service training, which is provided in all 16 districts, and the sole provider of two-year fire-related associate degree programs, which are currently available in five districts of the system.

In 1972 a fire-related associate degree program was initiated at an institution of the WTCS, Fox Valley Technical College (FVTC), which is located in a heavily-industrialized area of the state served by a sizable number of career fire departments. The majority of the students in the program were career fire fighters who attended classes on their off-duty days. Most attended simply to expand their personal knowledge base, although many also attended to utilize veterans' educational benefits. Few municipal governments or fire department administrators provided incentives for personnel to enroll in the program. Because the program quickly proved itself to be popular with career fire personnel, numerous other districts of the system made application to replicate it in their areas. The replicated programs enjoyed varying levels of success, almost all having positive enrollment projections during the program investigation stage that were seldom realized once the program was implemented. Nine such programs were enacted, five of which eventually being suspended due to inadequate enrollment. The programs which survived besides FVTC included those at Blackhawk Technical College (BTC), Milwaukee Area Technical College (MATC-Mil), Madison Area Technical College (MATC-Mad), and Gateway Technical College (GTC); institutions which, like FVTC, were located in areas of the state with significant numbers of career fire departments.

In the mid-1980s, a trend developed among career fire departments to promote personnel based on a wide range of considerations rather than departmental seniority alone. These

considerations included bonus points for armed service veterans, written and oral examination scores, and degree studies in addition to departmental seniority. It quickly became apparent that fire-related degrees combined with diligent work experience provided the edge necessary to achieve promotions. Several career fire departments further established the prerequisite that individuals must have degrees in order to even be considered for promotion. At about this same time, career fire departments were discovering that the number of applications for department entry-level positions were drastically increasing. This expanded labor pool prompted them to establish more stringent selection processes to include requiring applicants to have fire related degrees.

The message was loud and clear: get a degree if you aspire to career advancement above the rank of fire fighter. Numerous highly-motivated career fire personnel statewide consequently enrolled in the available degree programs. For many such individuals, however, enrollment was not viable because they simply lived too far away from the campus(es) where the programs were offered.

This research project is relevant to the "Analysis" Module (#5) of the National Fire Academy (NFA) *Executive Planning* course in that it attempts to solve the identified problem utilizing the three-step process of needs analysis outlined in the module. These steps include reviewing the current system, identifying the future (desired) direction, and determining the gap between them. The analysis provides the basis for recommending a solution to the problem.

LITERATURE REVIEW

Review of the literature will reveal several examples of experiences involving the need for and use of ITV technology in training and education. First, the review will explain why fire fighters

and aspiring fire fighters residing in certain areas within the state of Wisconsin do not have convenient access to fire-related degree programs. Next, it will relate the experiences of several entities in the use of ITV as an alternative to traditional classroom education. Thirdly, it will reveal the types of ITV systems in existence within the state of Wisconsin, the extent of their use by the educational delivery system(s), and the overall satisfaction with the results of such use. Lastly, it will list the special provisions that must be made in order to implement a successful ITV system.

Reasons For Lack of Local Programs

A major goal of the WTCS is to assist citizens, through education, in securing employment. Wisconsin Statues 38.04, "Technical College System Board; Powers and Duties" (1993), states that the authority for the initiation and development of educational programs is vested with the WTCS Board. When a district seeks to develop a new program or replicate a program existing in one or more of the other districts of the system, a program investigation must be conducted and the results submitted to the Board. According to the WTCS Board Educational Services Manual (1995), program investigation documentation must include evidence of unmet job market needs or an expanding workforce; evidence of waiting lists at other districts which offer the program(s) in question; and evidence that substantial numbers of the district's residents are enrolling in the program at the approved district(s). The Board will not approve program start-up unless the evidence strongly indicates a need for the program(s). Since there is an approximate annual statewide fire fighter job turn-around of only 85 positions, fire-related programs can clearly not be approved for every district. This situation results in sometimes substantial travel distances or even temporary relocation for citizens who wish to complete a fire-related degree program.

ITV As An Alternative

According to The Effects of Distance Learning: A Summary of Literature (1990), contemporary distance education has its origins in correspondence education, which was invented in the late 19th century as a means of providing instruction to learners unable to attend classes. There are two significant characteristics of all distance education. The first is that communication between learners and teachers is through print and writing or electronic media. The electronic media include broadcasts and recordings; narrow-casts by cable, satellite, instructional television fixed service (ITFS), and fiber transmission; interactive telecommunication by computer; audio and video teleconferences; or as is increasingly common, combinations of these media. The second characteristic arises from the first, and consists of a new approach to instruction, with the process of teaching being broken into its constituent parts. Some or all of these parts are prepared away from the learner, and communicated to the learner through the communications technology, with the possibility of interaction between the learner and the instructor(s) also being through communications technology. Since the introduction of the technology, proponent educators and specialists have celebrated television's potential to bring the real world into traditional classroom settings while critics denounced the medium's passive delivery system as a poor substitute for traditional educational methods.

Nelson (1989), wrote of a late 1980s survey of three high schools that used an ITV instructional system. It was reported that the students perceived little difference between the ITV class and the traditional classroom. In addition, the teachers involved reported no significant differences in students' test scores, grades and participation when comparing sections of ITV classes and classes taught in traditional classrooms.

According to Telecommunications for Learning (1991), Boise State University (Idaho) in 1990 conducted a study to test the general hypothesis that student performance and attitudes should not vary significantly whether the student was in the traditional classroom, in the on-campus ITV classroom, or the remote site ITV classroom. All three classes of the study's introductory accounting course (traditional classroom, on-campus ITV classroom, and remote site ITV classrooms) were taught by the same instructor and met the same days for 50-minute sessions, three times a week. Exams and quizzes at the remote sites were administered by proctors at the same time as in the ITV classroom. No group of students, therefore, had a time advantage over another group. Two questionnaires to measure student attitudes were administered during the last week of the semester. The conclusion of the study was that there were no significant differences among the three groups in student performance based upon an overall point tally. Any dissatisfaction related by the students via the questionnaires was more than offset by perceived benefits from taking the course through ITV to save the travel time to and from campus.

K. Brown, in his article in the February-March, 1995 International Society of Fire Service Instructors (ISFSI) publication, The VOICE, describes fire science courses in a two-year certificate program at Kirkwood Community College (Iowa) that are offered statewide over the Iowa Communications Network (ICN) fiberoptic system. The system links classrooms in each of the state's 99 counties with the three state universities and 15 community colleges. ICN brings fire science college courses to a greater number of people who had no access to them before, and the advantages of the program far outweigh the disadvantages, according to Mr. Brown.

M. Rodriguez, in his article in the May, 1995 issue of Emergency reports on a long-distance emergency medical service (EMS) education program developed for rural areas through Texas A

& M University's College of Medicine. He quotes an ambulance provider as saying, "This saved each of our people 50 miles of driving each week. In addition, without the satellite course our people wouldn't have received as thorough an education as they did. With the satellite course they could take the course together and study together. If they would have had to drive to class, only one or two people could have gone at a time."

ITV Systems in Wisconsin

The Wisconsin Distance Education Video Networks List, Wisconsin Educational Communications Board (1997), was compiled as a service to educators, legislators and other interested persons. The list contains all known existing regional audio/video/video-conferencing networks in Wisconsin that transmit educational programming. Each listing contains the year the network was established, the institutions participating in the network and the transmission technologies used. A portion of the list, in alphabetical order, is as follows:

Chippewa Valley Technical College (CVTC) Network

- established 1990
- participating institutions include all five regional campuses of CVTC
- point-to-point microwave, full-motion video, two-way audio

Dane County Area ITFS Network (DCAIN)

- established 1990
- participating institutions include Dane County public schools, University of Wisconsin (UW)-Madison Outreach Development, and MATC-Mad
- ITFS, one-way video, two-way audio via phone return

EastWING-Chilton ITFS System

- established 1986-1995
- participating institutions include FVTC, Lakeshore Technical College (LTC), Moraine Park Technical College (MPTC), Northeast Wisconsin Technical College (NWTC), Northeast Wisconsin Telecommunications Education Consortium (NEWTEC), and UW-Oshkosh
- ITFS

Eau Claire Area ITFS User Group

- established 1990
- participating institutions include five area high schools, CVTC, UW-Eau Claire
- ITFS, one-way video, two-way audio via phone return

FVTC Network

- established 1985
- participating institutions include two FVTC campuses, four FVTC regional learning centers, three medical centers, one hospital, one fire department
- ITFS

GTC Network

- established 1996
- participating institutions: three regional campuses of GTC
- digital fiberoptic J-series two-way full-motion video and audio

Jefferson Eastern Dane Interactive (JEDI) Network

- established 1996

- participating institutions include nine public school districts and three regional campuses of MATC-Mad
- analog fiberoptic, two-way, full-motion video and audio via cable

LTC Network

- established 1985
- participating institutions include three LTC campuses, 13 public school districts, 10 hospitals and medical centers, five area fire departments
- ITFS, using transmitters at six locations

MATC-Mil Network

- established 1996
- participating institutions include four MATC-Mil campuses
- ITFS

MPTC Network

- established 1996
- participating institutions: three MPTC campuses, three area high schools
- analog fiberoptic, two-way, full-motion video and audio

Nicolet Area Technical College (NATC) Network

- established 1995
- participating institutions: two NATC campuses
- ITFS and fiberoptic

Northern Wisconsin Educational Communications Systems (NWECS)

- established 1992

- participating institutions: seven public school districts, UW-Superior, five campuses of Wisconsin Indianhead Technical College (WITC)
- interconnected with South Central Instructional Network Group (SCING), Western Wisconsin Instructional Network Group (WestWING), and Wisconsin Overlay Network for Distance Education Resources (WONDER)
- digital fiberoptic E-series two-way, full-motion video and audio

SCING

- established 1993
- participating institutions: 11 area high schools, three MATC-Mad campuses, four Mid-State Technical College (MSTC) campuses, UW-La Crosse, UW-Stevens Point and Western Wisconsin Technical College (WWTC)
- interconnected with NWECS, WestWING, and WONDER
- digital fiberoptic E-series two-way, full-motion video and audio

Southwest Wisconsin Distance Education User Group

- established 1987
- participating institutions: 15 high schools, Southwest Wisconsin Technical College, UW-Platteville
- ITFS, one-way video, two-way audio

Three River Instructional Telecommunications Operational Network (TRITON)

- established 1996
- participating institutions: nine public school districts, St. Norbert College, three area campuses of NWTC

- digital fiberoptic J-series two-way, full-motion video with continuous view

Wausau Area Narrowcast Users Consortium/North Central Technical College (WANUC/NTC)

- established 1987
- participating institutions: CWETN, NATC, six NTC campuses, 11 high schools/school districts, UW-Stevens Point
- connected to WONDER
- ITFS, using four channels, and point-to-point microwave

WestWING

- established 1994
- participating institutions: 11 area high schools, UW-River Falls, WITC
- interconnected with NWECS, SCING, and WONDER
- digital fiberoptic E-series full-motion video with continuous audio over quad split

WWTC

- established 1984
- participating institutions: six WWTC campuses
- connected to WONDER
- microwave and coaxial cable link between La Crosse and Independence

Wisconsin Indianhead Network (WIN)

- established 1992
- participating institutions: five public school districts and WITC

- ITFS, two-way video and audio between WITC and one school district. One-way video and two-way audio between all other sites

WONDER

- established 1995
- participating institutions: CVTC, FVTC, NTC, WWTC, five UW campuses
- interconnected with NWECS, SCING, and WestWING
- digital fiberoptic E-series full-motion video and continuous audio

According to the WTCS pamphlet, Leading the way in the use of educational technology for teaching and learning (1997), Wisconsin's experience with ITV as a teaching medium has increased dramatically in recent years. In the 1995-96 school year over 10,000 telecourse students were served with college-level instruction by the WTCS alone. ITV is also bringing school-to-work opportunities directly to state public schools, as evidenced by the fact that over 1,900 students under the age of 18 received college-level classes. Several WTCS institutions have developed joint degree programs with not only UW schools, but Milwaukee School of Engineering, Viterbo College, Marquette University, and Gunderson Clinic and Lutheran Hospital, as well.

According to FVTC's 1996-97 ITV System Evaluation Tabulations, a significant number of students gave high marks to their ITV experience (Appendix A).

Provisions to Implement ITV

Two-way television provides for the simultaneous transmission of video and audio signals among several remote locations. Students and teachers at each location can usually see and hear all other participants. The links utilize microwave technology, coaxial cable, or fiberoptic cable.

Equipment configurations differ among institutions, resulting in a systems model that builds on two separate designs found in ITV projects across the country. The two designs are fixed or studio, and portable. The portable design allows maximum flexibility, and it is primarily used for special events (J. Le Baron, 1991).

According to FVTC's ITV Instructor's Handbook (1994), the school has two classroom designs. Design number one includes two video cameras to allow for close-up and medium shots of the instructor's desk. There is also an overhead or document camera located on the counter providing projection of print and objects similar to an overhead projector. Located behind the instructor is a third video camera that provides a view of the studio classroom. Other resources that the instructor can switch to are a videocassette recorder (VCR), laser disk player, and a computer. These allow the instructor to show video, graphics and text materials right from the desk location. All resources are switched at the instructor's fingertips as needed. The instructor also has a facsimile transmitter (FAX) machine in close proximity which is programmed to send necessary documents to the various locations connected over the system. These documents include corrected lessons, new assignments, or other printed materials. The other locations also have FAX machines which allow the students to "hand-in" completed quizzes or assignments in "real" time. The instructor's microphone can be activated or deactived by a switch. Students in the studio classroom are heard via the classroom microphones and are broadcast over the transmitters along with the instructor's voice. Design number two has two cameras to allow for an adjustable shot of the instructor's desk and the studio classroom, and an overhead or document camera to allow for projection of print and objects. A VCR, laser disk player, and computer are also provided as in design one.

Remote sites are equipped with TV monitors, one or two video cameras controlled from the broadcast classroom, and microphones and speakers. The intent of the ITV concept is to make the technology as transparent as possible while using the equipment to make effective delivery of live instruction.

PROCEDURES

The research procedures used in this report included a literature review and interviews with administrators, educators, and students associated with fire-related education ITV delivery programs and/or systems. The literature reviewed consisted of books, applied research projects, magazine articles, and pamphlets found in the NETC LRC; and technology updates and reports of the state educational delivery system(s).

Interviews were conducted with ITV delivery system administrators, media directors, and scheduling managers. Educators with varying degrees of ITV teaching experience were also interviewed, as were students who had participated in ITV course deliveries. All interviews were limited to one-half hour in length and were either conducted face-to-face or by telephone. A listing of prepared questions designed to elicit pertinent information regarding ITV instruction was asked of persons in each target group (Appendices B and C).

Assumptions and Project Limitations

It was assumed that all information collected for this report, whether it was from the literature reviewed or personal consultation and interviews, was correct in nature as to content and/or the way it was presented to this author.

The queries of the NETC LRC resource database using the words "fiberoptic," "interactive," "video," and "training" were not successful in accessing information regarding the use of two-way, interactive video systems for training. A subsequent query utilizing the phrase "distance education" yielded 10 sources of information regarding various distance education methods and technology, including ITV. Several sources of information concerning the use of ITV in general education applications were found, as well. Literature addressing experiences in fire/emergency-related ITV education, however, was very limited.

A wealth of information regarding ITV use by the education delivery system(s) in Wisconsin was eventually discovered; however, the fact that this information pertained to only one state's experiences could be viewed as a project limitation.

RESULTS

Research Question #1

Why do fire fighters and/or aspiring fire fighters residing in certain areas of the state of Wisconsin not have convenient access to fire-related degree programs?

The WTCS has divided the state of Wisconsin into 16 areas of varying sizes. The divisions usually occur along county and/or public school district boundaries. Each of the areas (WTCS districts) has at least one campus to serve the educational needs of district citizens.

Wisconsin's 5,000,000-plus population is not distributed equally among the WTCS districts but is for the most part concentrated in the east/southeast portion of the state. Likewise, each and every district does not contain a major metropolitan area. Most districts are actually predominantly rural in make-up and contain few cities or towns with a population of more than 15,000 citizens, the point at which emergency services are likely to be provided by paid rather than volunteer fire departments. Consequently, career fire fighters (those most likely to enroll in degree programs) are sometimes located hundreds of miles away from major metropolitan areas (where the fire-related degree programs are located). If these career fire fighters wish to pursue a degree, travel distance to an existing program can be prohibitive. One possible solution is replication of the program in their district(s) of residence.

The WTCS Board only allows replication of programs if:

- Evidence of unmet needs or expanding workforce exists.
- Evidence of waiting list(s) exist in districts with the approved program(s).
- Evidence that substantial numbers of district residents are enrolling in the program(s) in other districts.

Since only about 85 statewide entry-level fire fighter jobs become available annually, evidence of unmet needs or expanding workforce can rarely be provided. Likewise, evidence that substantial numbers of fire fighters are enrolling in the program(s) in other districts is difficult to provide because travel distances, in some cases, may be so great as to prohibit such enrollment. Evidence of waiting lists in districts with approved programs does exist; however, the WTCS Board rarely approves replication unless all four conditions are proven. This strict oversight by the Board is necessitated by the high cost of program start-up versus the sometimes-low rate of return.

Research Question #2

Is utilization of an ITV system a viable alternative to traditional classroom delivery of fire-related education?

Literature review revealed that experiences with ITV in various educational fields have been positive. Nelson (1989) wrote that surveys of high schools which participated in ITV instruction revealed little difference between ITV students' levels of participation, test scores, and grades from those of students in conventional classroom settings. The same results were obtained in a study of ITV instruction at the college level (Telecommunications for Learning, 1991). K. Brown (1995), revealed that ITV classes in fire-related subjects conducted by an Iowa community college provided considerable advantages for students, as did the Texas EMS distance education classes reported by M. Rodriguez (1995). R. Brooks, in his "Training Perspectives" article in the September, 1996 issue of Fire Chief described the efforts underway at the NFA to increase the use of distance education (including ITV) to deliver academy courses to America's fire fighters. In October, 1995, the NFA hosted a two-and-a-half-day "Distance Learning for the Fire Service" symposium. NFA Superintendent, Dr. Dennis Onieal, plans over the next few years to raise by 18 percent the total of the estimated 1.2 million United States fire fighters served by the academy. He is convinced distance education, including ITV, is the best way to meet this goal.

Interviews with students who had participated in ITV classes conducted by institutions of the WTCS revealed that, overall, they enjoyed the experience. Most cited the fact that the classes allowed them to participate in the desired programs without having to travel long distances to do so. Many appreciated the flexibility the classes afforded them.

Research Question #3

What kinds of ITV systems currently exist in the state of Wisconsin?

Currently, the state has 38 audio/video/video-conferencing networks serving kindergarten through secondary (K-12) schools, institutions of the WTCS and UW Systems, private colleges, hospitals, clinics, medical centers, correctional institutions, and fire departments. These networks use forms of ITV technology best-suited for their members' strategic goals and financial resources. The technology forms include multi-site one-way ITFS broadcasting (which has minimal receive site equipment costs and connection expenses but real-time feedback limited to audio-only), one-way and two-way microwave, wideband fiberoptics (which allow delivery of two-way, full-motion video courses), compressed video, digital fiberoptics, analog fiber systems, or combinations of these different technologies. These varying forms came about through a "local approach," which has resulted in successful intra-area applications; however, because the differing technologies were chosen primarily to meet each one of the local needs, interconnection of the systems to allow inter-area or inter-state broadcasts can be a major challenge.

Research Question #4

What experience do the educational delivery system(s) have with two-way ITV as a teaching medium?

In recent years educational systems in the state of Wisconsin have gained considerable experience in the use of two-way ITV as a teaching medium, reaching thousands of learners through this technology. ITV networks connect institutions of the UW and WTCS to K-12 schools, hospitals and clinics, industry sites and fire departments; county and state correctional facilities are also connected via ITV links. These networks bring school-to-work opportunities directly to the state's public schools; just-in-time instruction to business and industry, health care

and correctional facilities, and labor union and state workforce development centers is provided as well.

Research Question #5

Does two-way ITV technology provide the feature desired of a viable alternative delivery system, namely class interaction similar to that experienced in conventional classrooms?

Review of the literature did not conclusively show that ITV completely provides this feature. Results of ITV student surveys generally reported the students having perceived little difference between their ITV experience and that of a conventional classroom, or their test scores and grades were reported as being similar to those of conventional classroom students. Any student dissatisfaction with ITV courses reported in the literature articles was, in this author's opinion, glossed over by stating it (the dissatisfaction) was more than offset by the perceived benefit of travel time saved. Research was thus conducted via telephone interviews with students who had participated in a 1996-97 school year ITV building construction course that originated at FVTC and was broadcast to remote sites in northern and northwestern Wisconsin. Several attempts were made over a five-day period to contact six individuals; however, only three individuals were successfully interviewed (W. Resch , J. Foth and S. Murphy on August 26 and 27, 1997).

All three individuals interviewed reported that, overall, they "liked" the experience. All three appreciated the fact that the ITV course allowed them to work and still attend school; all three were also enthusiastic about the fact that the ITV course significantly reduced travel requirements. Two of the three reported appreciation for the flexibility the courses afforded (W. Resch and J. Foth, telephone interviews, August 26, 1997).

However, when asked if they felt that the experience was comparable to that of a conventional classroom, none of them answered completely in the affirmative. All three reported some aspect of the ITV course that they "didn't like." One stated that it "felt like a classroom experience" (because he attended the classes in a remote site classroom), that the communications were "good," and he perceived the experience as being "real time." He disliked the fact that he couldn't always ask the questions he wanted answered during class because of shortcomings in the technology (S. Murphy, telephone interview, August 27, 1997). The other two interviewees complained of feeling that they were "missing something," particularly during class labs (W. Resch and J. Foth, telephone interview August 26, 1997). One of the latter two complained that he did not always feel it was "real time" (W. Resch, telephone interview, August 26, 1997). In concluding the interviews, however, all three stated they would definitely take another ITV course.

Research Question #6

What special provisions must be made in order to implement a successful ITV system?

The implementation of ITV systems is an expensive undertaking. Regardless of the communication technology chosen, classroom designs require considerable amounts of instructor support equipment. This equipment includes video cameras, monitors, overhead or document cameras, a VCR, and/or a laser disk player, a computer, a FAX machine, microphones, and speakers. Most of this equipment must be duplicated at each of the remote sites if the system is to be successful. The equipment and installation costs could exceed $50,000.00 per site. Additionally, there are monthly charges for the communication technology used. Only one

example of these charges, that for fiberoptic cable service at an approximate monthly fee of $1,700.00 per site, will be presented here (S. Carman, personal interview, June 16,1997).

Other provisions that must be made for a system's success include adequate faculty training, teaching support, student support, and business systems alignment. Lack of adequate training was the most common concern expressed by WTCS ITV instructors, followed by site support shortcomings at remote classroom sites (Leading the Way in the Use of Educational Technology for Teaching and Learning, 1997).

DISCUSSION

The decision to explore the use of ITV as a viable delivery system for fire-related degree programs was made in an attempt to solve a problem affecting a sizable number of aspiring and already-employed fire fighters. Wisconsin's inability to satisfy the demand of its fire service for fire-related degree programs via conventional classroom courses was a problem undoubtedly shared with fire training delivery systems throughout the nation and the world. The limited experience addressing this problem through ITV application was also shared, as evidenced by the overall shortage of fire-related ITV literature.

While distance education through print and writing (correspondence courses) has been in existence nearly a century, electronic media distance education (including ITV) has only come into prominence within the last 10 years; as education leaves behind slow-paced, geographically-defined institutions for the "classroom without boundaries." This relatively short period of activity obviously contributed to the limited supply of research data available, particularly that regarding ITV application in fire-related instruction. As this author applied the three-step process of needs analysis (outlined in Module #5 [Analysis] of the NFA *Executive Planning* Course) to the

problem, it became evident that the instructional delivery issues facing fire-related education were a microcosm of those facing education in general.

From the outset, ITV was determined to have considerable potential as a solution to the identified problem. All pertinent literature available at the NETC LRC that was reviewed provided glowing reports of instructor and student satisfaction with their ITV experience. Data from various ITV course surveys reported that students had perceived little difference between ITV instruction and that available in a conventional classroom. The data also reported ITV students' test scores and grades as being similar to those of conventional classroom students, and any student ITV dissatisfaction was reported as being more than offset by the perceived benefits of schedule flexibility and reduced travel time. Similar reports of positive instructor/student ITV experiences were obtained from UW and WTCS general education ITV surveys.

This author learned that within the last five years, Wisconsin had invested heavily in electronic distance education, with nearly 40 audio/video/video-conferencing networks statewide. He further learned that ITV instruction had been applied to fire-related degree programs in a limited fashion; with FVTC serving as the primary district and CVTC, NTC, and MSTC serving as the cooperating districts. Relatively small numbers of students had been served, but results were considered a success. Why not explore the potential of solving the identified problem through expansion of ITV course deliveries?

Since FVTC was the only WTCS institution with an approved fire-related degree to have functioned as a primary district, it was the logical place to continue research via facility visits and personal interviews with ITV administrators, educators, and students.

On June 28, 1997, FVTC Fire Protection Technician Program Chair/Instructor David A. McFadden was interviewed regarding his experiences with fire-related ITV instruction the previous school year. He stated that while three districts were being served via fire-related ITV courses through the WONDER network, links between the various system technologies would need to be provided if state-wide deliveries were to be made in the future. He was asked a prepared list of questions (Appendix B). In his opinion, there were five positive aspects of ITV instruction. They included:

1. Allowed persons normally unable to access a degree program the chance to do so.
2. Provided real time instruction.
3. Class deliveries interrupted by emergency calls were videotaped for later viewing.
4. Students with access to the technology could E-mail homework to the instructor.
5. Only minimal travel (albeit sometimes over long distances) was required for labs.

He did not relate any negative aspects, but rather provided a list of precautions for would-be ITV instructors:

1. Calendar must be diligently maintained so that assignments and final exams are mailed on time.
2. Private counseling and student advising must be accomplished by telephone in most cases.
3. Class delivery methodology (and sometimes, curriculum) must be altered to "fit" ITV application.

In closing, he stated that ITV, in three key words, provides adaptability, flexibility, and openness.

A tour of FVTC's ITV classroom was also provided on June 24, 1997, which allowed this author the opportunity to see first-hand how the necessary ITV equipment is used (during a simulated class session).

On August 21, 1997, Mr. Glenn Rutgers, FVTC ITV Manager, was contacted regarding student evaluation information for all ITV classes conducted in the 1996-97 school year (Appendix A). The tabulations provided showed high marks from students regarding their ITV experience.

One final bit of research needed to be conducted. Even though the literature had reported any student dissatisfaction with ITV to be more than offset by perceived benefits, this author remained skeptical, and he wanted to hear from fire-related ITV students first-hand their opinions regarding this issue. In the interviews, conducted August 26 and 27, 1997, all students reported that any dissatisfaction they experienced during the ITV course was overwhelmingly offset by the benefits realized.

It is the opinion of this author that, in spite of substantial equipment purchase and support training costs, ITV is a viable fire-related education delivery system for persons unable to physically attend courses because of travel distance and time.

RECOMMENDATIONS

Two-way, ITV is a relatively new tool within the educational delivery systems of Wisconsin. A substantial number of distance education networks (including ITV networks) are already in place. However, ITV technology advances are occurring daily, and the educational delivery systems are scrambling to keep pace. Finding the funding to purchase ITV equipment and pay network costs is, in itself, a challenge. Planning, support and training for ITV instructors are also

major issues affecting the commitment to and/or expansion of ITV use in education (including fire-related education). Local politics will continue to play a role in technology change or linkage decisions. In spite of these issues, the data collected for this research project support the potential of ITV as a viable delivery system for fire-related education. It is the recommendation of this author that efforts toward expansion of the medium's use be vigorously continued.

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APPENDIX A

ITV SYSTEM EVALUATION
Tabulations
Spring 1997

Course Title: Total numbers for ALL COURSES

Site Location: ALL SITES (Origination from G-104)

The following are totals for each question, and comments for each class.

1 Strongly Agree-- 2 Agree --3 Neutral --4 Disagree --5 Strongly Disagree **Number of Respondents 165**

1.	ITV is compatible with my learning style and is an effective delivery medium for the course.	1(29)	2(58)	3(49)	4(20)	5(8)
2.	The video monitor/screen is placed where I can see it comfortably.	1(70)	2(70)	3(15)	4(5)	5(5)
3.	I could clearly see the materials presented by the instructor on the video monitor.	1(53)	2(60)	3(26)	4(19)	5(4)
4.	I could hear the instructor's voice clearly and distinctly over the system.	1(42)	2(69)	3(28)	4(18)	5(9)
5.	The voices of the students at other sites were also clear and easily understood.	1(15)	2(27)	3(40)	4(42)	5(42)
6.	I felt comfortable interacting with the instructor and students at other sites.	1(26)	2(56)	3(44)	4(22)	5(16)
7.	I felt the distribution of materials for this class was done in a timely and coordinated manner.	1(36)	2(60)	3(26)	4(21)	5(23)
8.	The classroom provided a good environment in terms of seating, temperature, size, and lighting.	1(45)	2(65)	3(32)	4(16)	5(6)
9.	ITV staff promptly resolved technical problems or disruptions in the audio or visual system.	1(52)	2(58)	3(39)	4(13)	5(0)
10.	Technical problems did not interfere with my learning of the course content.	1(34)	2(66)	3(40)	4(16)	5(9)
11.	The ITV system has made it possible for me to take courses I would otherwise not have been able to take.	1(26)	2(42)	3(56)	4(27)	5(17)
12.	I would take another ITV course.	1(43)	2(53)	3(33)	4(14)	5(17)

APPENDIX B

INTERVIEW QUESTIONS FOR ITV INSTRUCTORS

1. How long has your institution used ITV as an instructional delivery medium?

2. How long has your institution used ITV specifically as an instructional delivery medium for fire-related degree program courses?

3. As an ITV origin site, how many areas of the state do you serve utilizing this medium?

4. As an ITV origin site, how many areas of the state do you serve utilizing this medium specifically for fire-related degree program courses?

5. From your perspective, what are the negative aspects of ITV instruction for fire-related courses?

6. Do you have any final comments?

APPENDIX C

INTERVIEW QUESTIONS FOR ITV STUDENTS

1. What aspects of ITV instruction did you find favorable? (Please List)

2. What aspects of ITV instruction did you find unfavorable? (Please List)

3. Did you find the experience comparable to that of a conventional classroom?

4. Would you take another ITV course?